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METHOD OF TREATING PROTEINS WITH SATURATED ALIPHATIC POLYAMINES AND RESULTING PRODUCT

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9 Claims. (Cl. 260—112)

1

This invention relates to a composition of matter and to the method of producing the same. The product is useful as a binder in paints, such as water-soluble paints, etc., and an adhesive or binder for paper laminations, and for a variety of other uses.

The present application constitutes a continuation of our copending application Serial No. 666,828, filed May 2, 1946, now abandoned.

An object of the invention is to provide a compound having unusual and valuable properties as a sizing or binder in paints, such as water-soluble paints, as a binder or adhesive for paper laminations, and for many other uses, the product being formed from relatively inexpensive starting materials and through the employment of a very simple process. A further object is to provide a method of producing a product through the employment of simple and inexpensive steps. Yet another object is to provide a simple method of utilizing soluble blood or fractions thereof in combination with a reacting material forming new and valuable products. Other specific objects and advantages will appear as the specification proceeds.

We have discovered that by reacting a polyamine with blood or egg proteins a highly valuable product having the uses above described may be obtained. Excellent results have been obtained through the use of ethylene diamine and blood serum in an aqueous solution, the solution being heated to a temperature in the neighborhood of 185° F. and kept under constant agitation. Upon cooling, the solution is ready for use.

A very desirable protein for use in our process is a serum fraction of animal blood. This product is commercially prepared by collecting the blood of cattle, hogs, or sheep at the slaughter house, adding an anti-clotting agent, centrifuging to separate the hemoglobin fraction from a plasma fraction, treating the plasma fraction to remove fibrin therefrom and then drying the resulting liquid serum.

Another very desirable starting material is a hemoglobin fraction obtained from animal blood as above explained, or we may start with whole blood, either liquid or in dried form.

Alternately, we may start with a protein obtained from egg, either the yolks or the whites. In fact, we may use either blood or egg or any protein-containing fraction obtained from blood or egg or any combination of such materials and fractions. The dry form of the protein material is preferred but the material may also be utilized in liquid or solution form.

2

All of the polyamines are satisfactory. We prefer to use ethylene diamine because it produces a more water-insoluble product in the final drying step. Very satisfactory results have been obtained with diethylene triamine, triethylene tetramine, and tetraethylene pentamine.

A specific example or formulation may be given as follows:

	Parts
Dried blood serum	8
Water	91.2
Ethylene diamine	0.8
	100

The above formula is best prepared by first dissolving the blood serum in the water, making a complete solution at room temperature (70-80° F.). Ethylene diamine is then stirred in until completely dispersed. The solution is then subjected to steam or indirect heat and kept under constant agitation until a temperature of about 185° F. has been reached. The solution is then cooled and is ready for use.

In place of ethylene diamine, as set out in the above example, we may substitute any one of the other preferred polyamines, namely, diethylene triamine, triethylene tetramine, and tetraethylene pentamine, for obtaining excellent results; and in place of the dried blood serum we may substitute any other material containing blood or egg proteins.

The above formulations all produce hard, brittle films when air-dried, but we have found that the films may be flexible through the addition of a suitable plasticizer. For example, we find that the films can be made flexible by the addition of from 20% to 50% of any one or a combination of the following plasticizers:

Glycerol
Ethylene glycol
Diethylene glycol
Triethylene glycol
Propylene glycol
Polyethylene glycol 200 (predominantly tetraethylene glycol having a molecular weight of approximately 200)
Polyethylene glycol 300 (predominantly hexaethylene glycol having a molecular weight of approximately 300)
Polyethylene glycol 400 (predominantly nonaethylene glycol having a molecular weight of approximately 400)

It will be understood that appropriate plasticizers other than those above listed may be